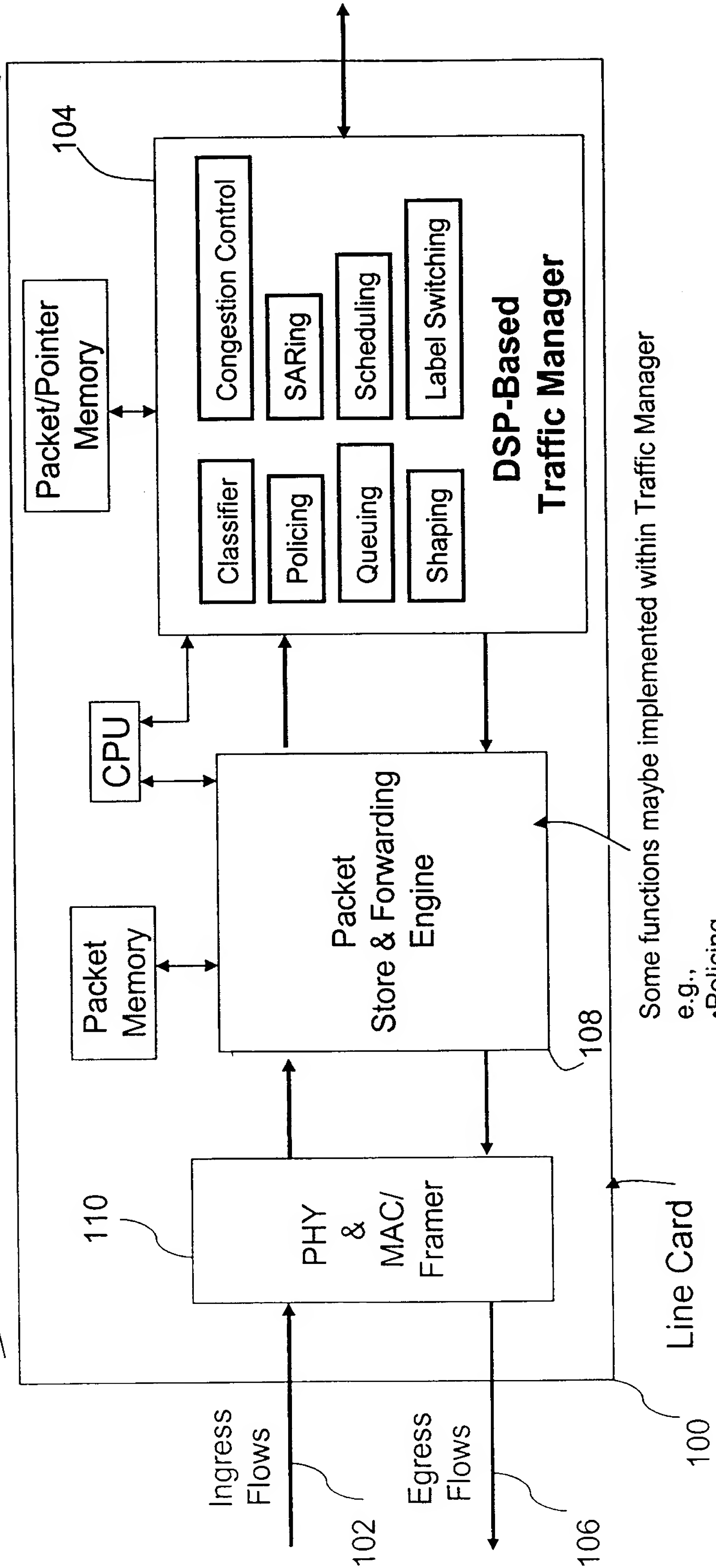
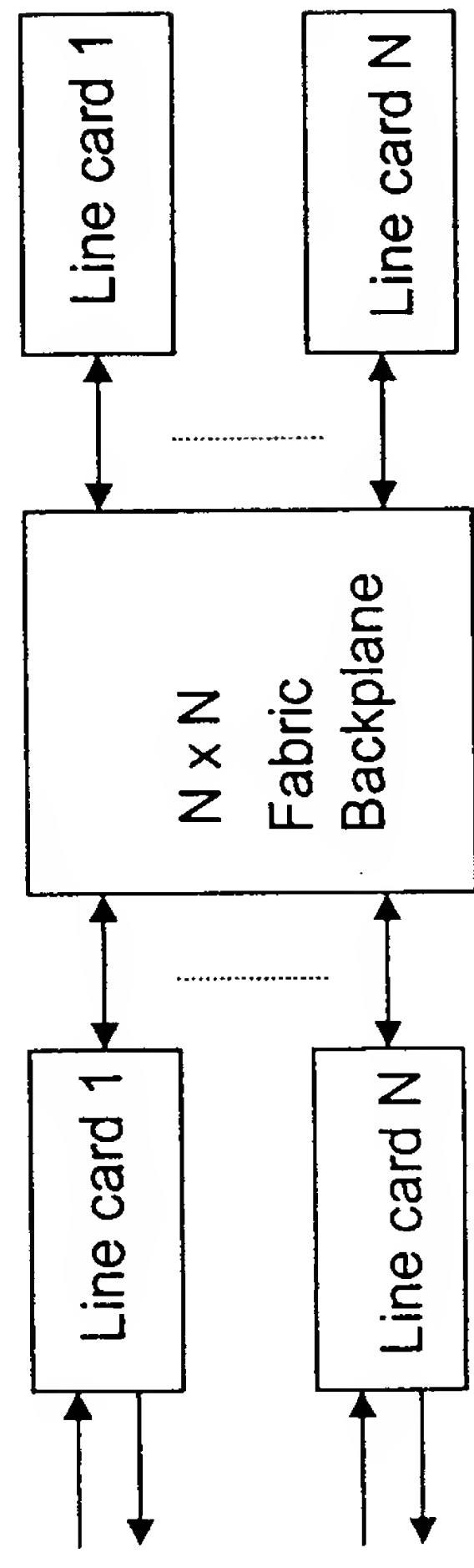


Line Card with DSP-Based Traffic Manager

10



Some functions maybe implemented within Traffic Manager  
e.g.,

- Policing
- Classifier or Content Addressable Memory (CAM)
- Segmentation and Reassembly (SARing)

FIG. 1

Packet Store & Forwarding Engine

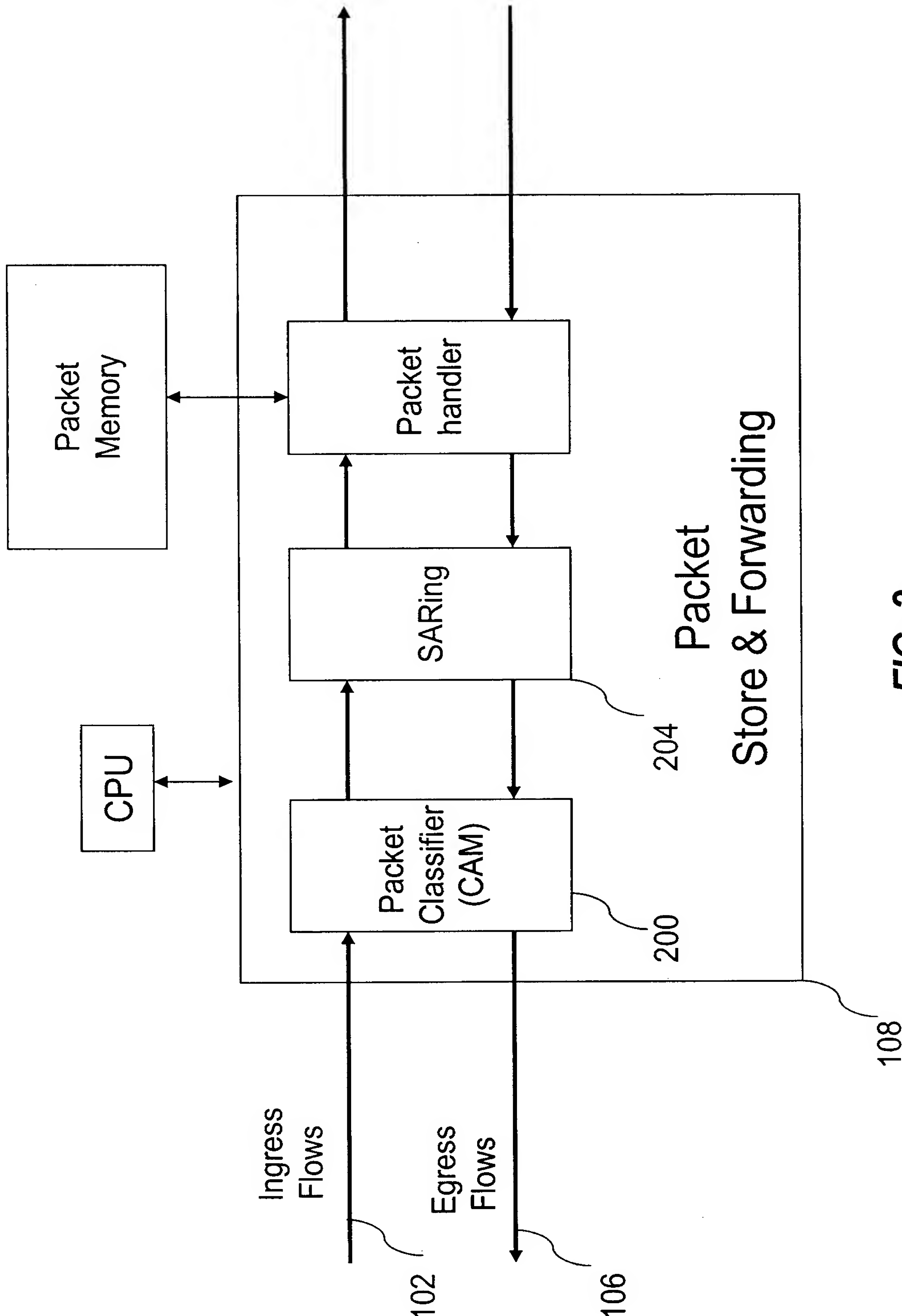


FIG. 2

Packet Classifier & SARing

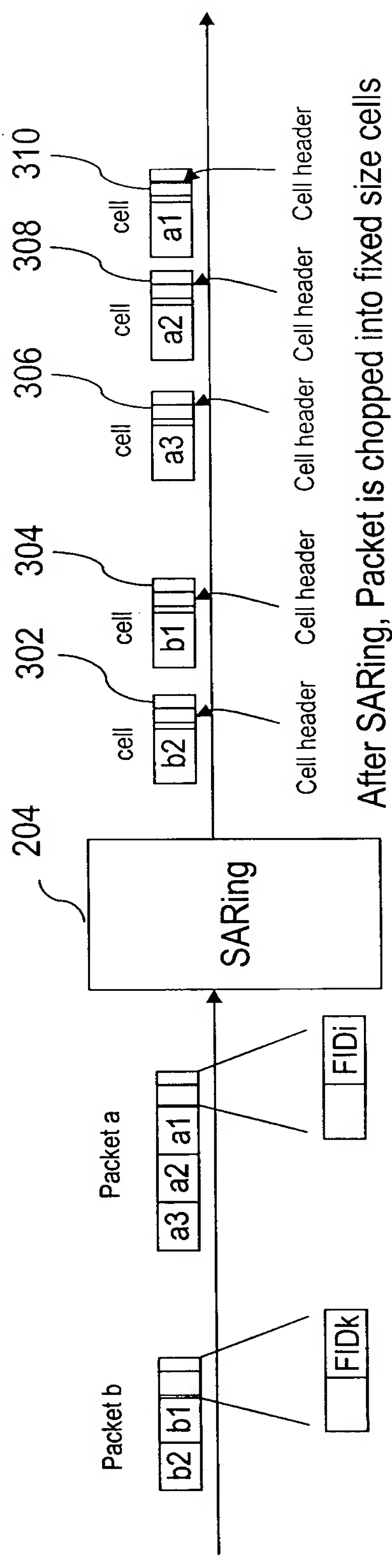
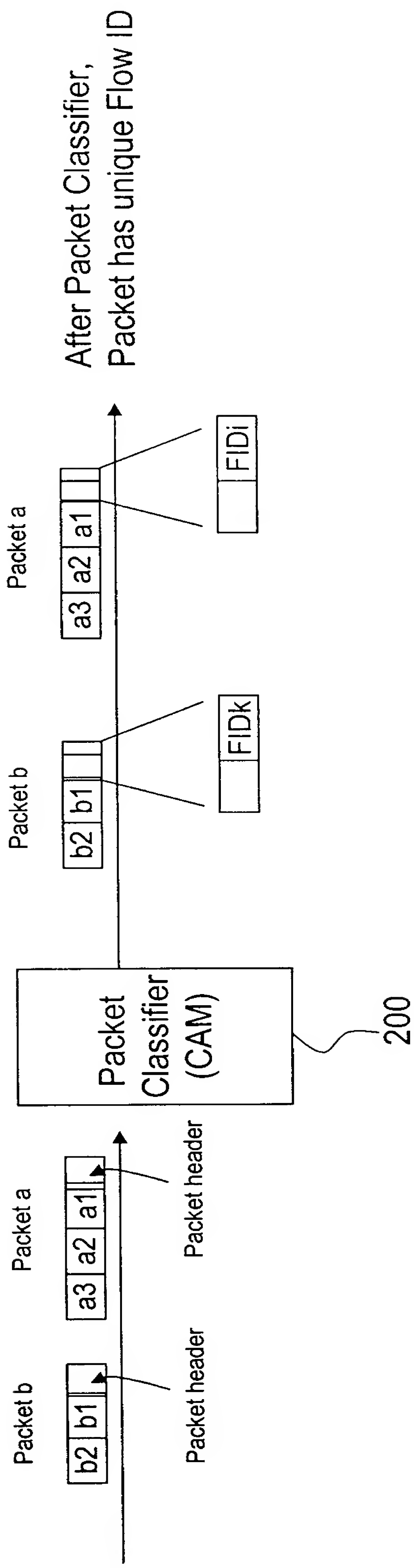


FIG. 3

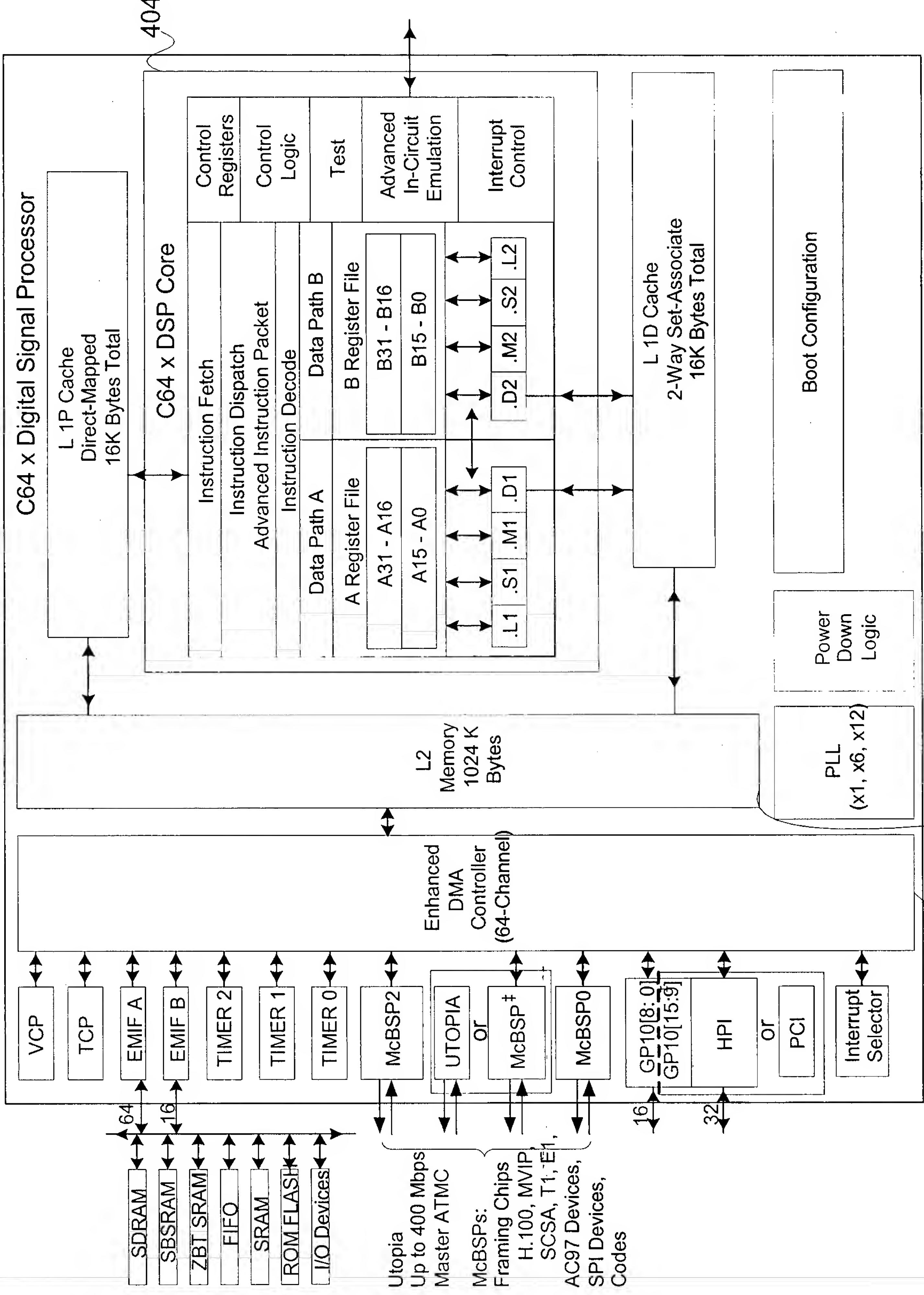


Fig. 4

408 412

# FUNCTIONAL BLOCK DIAGRAM

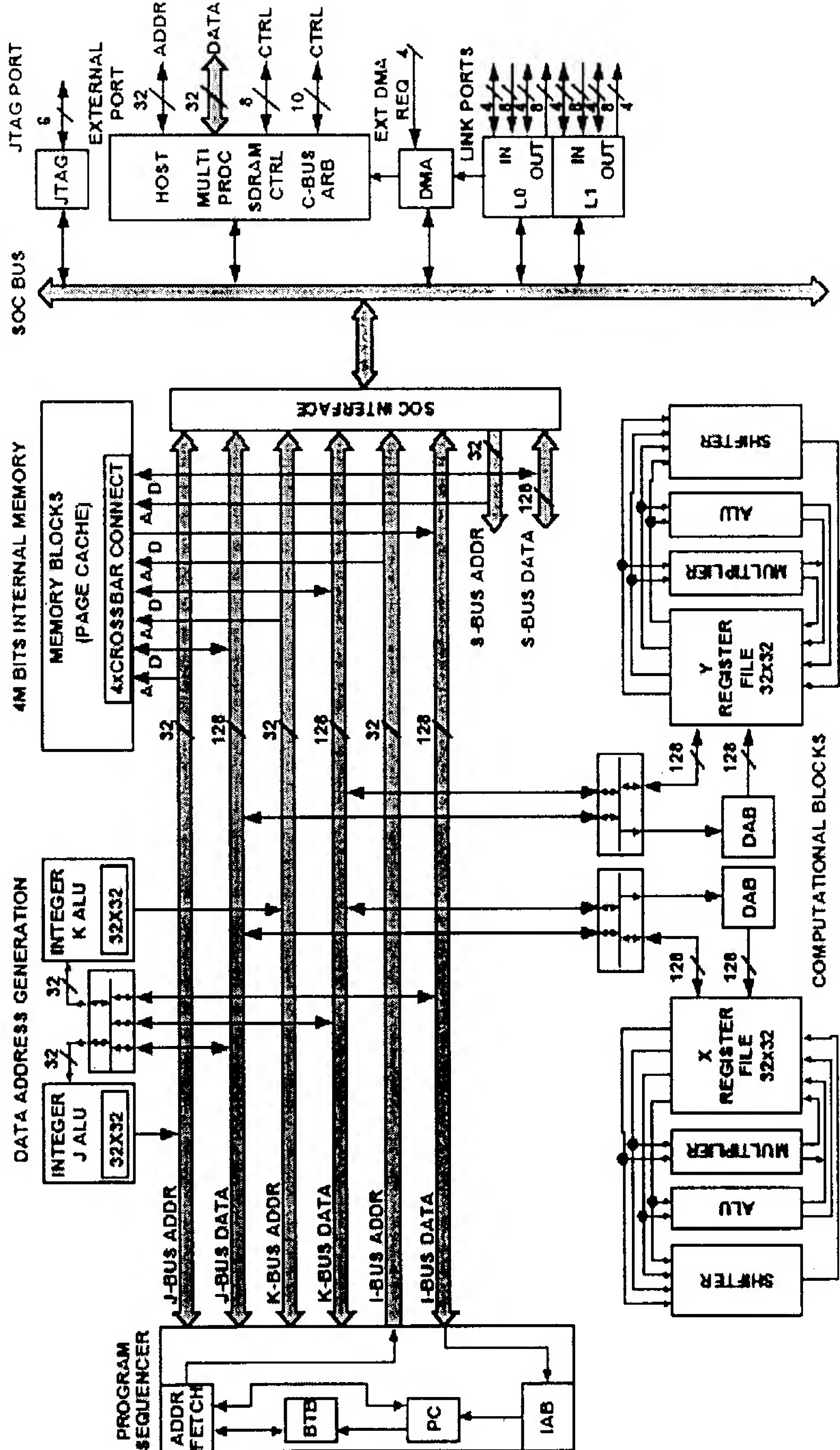


Fig. 5

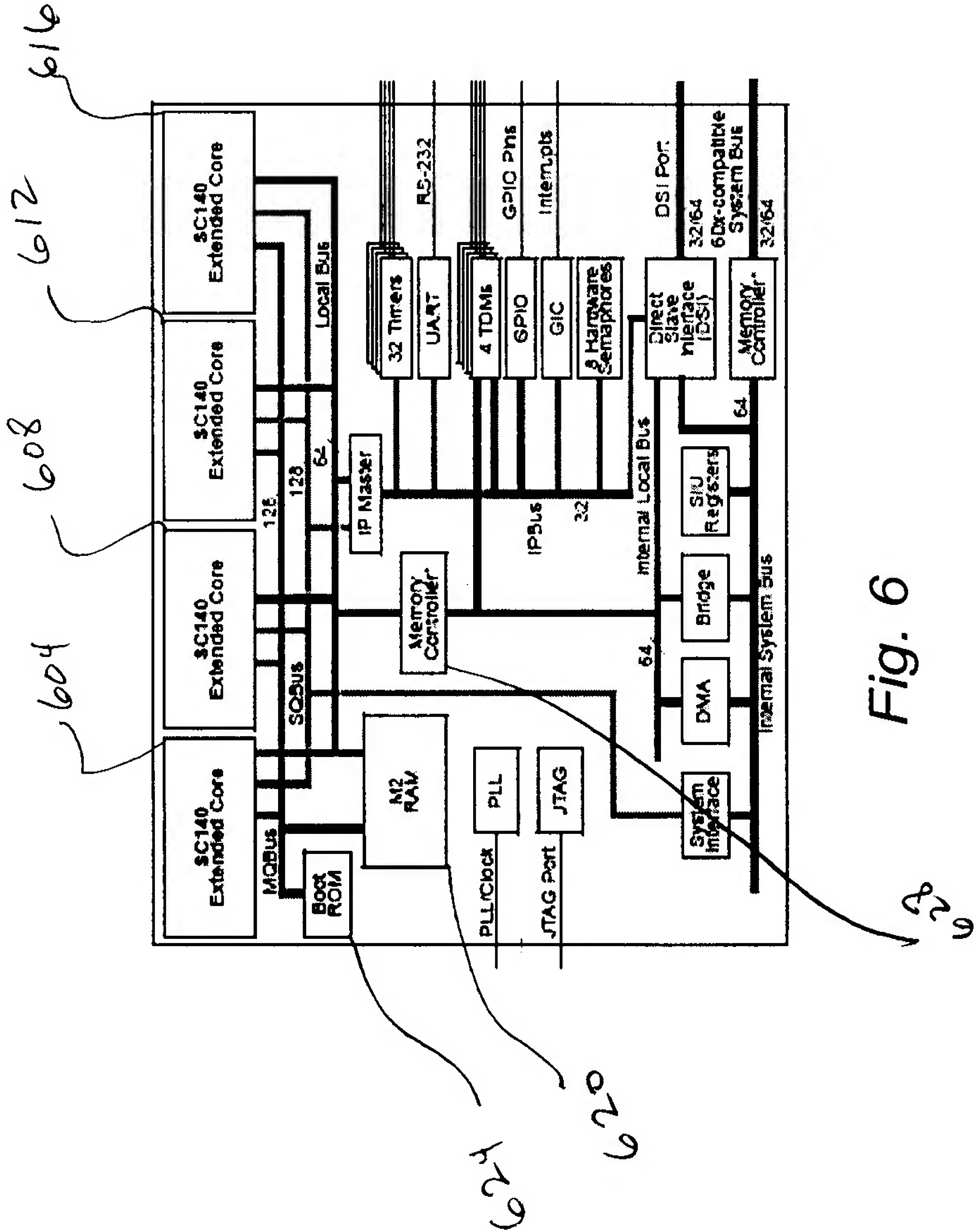
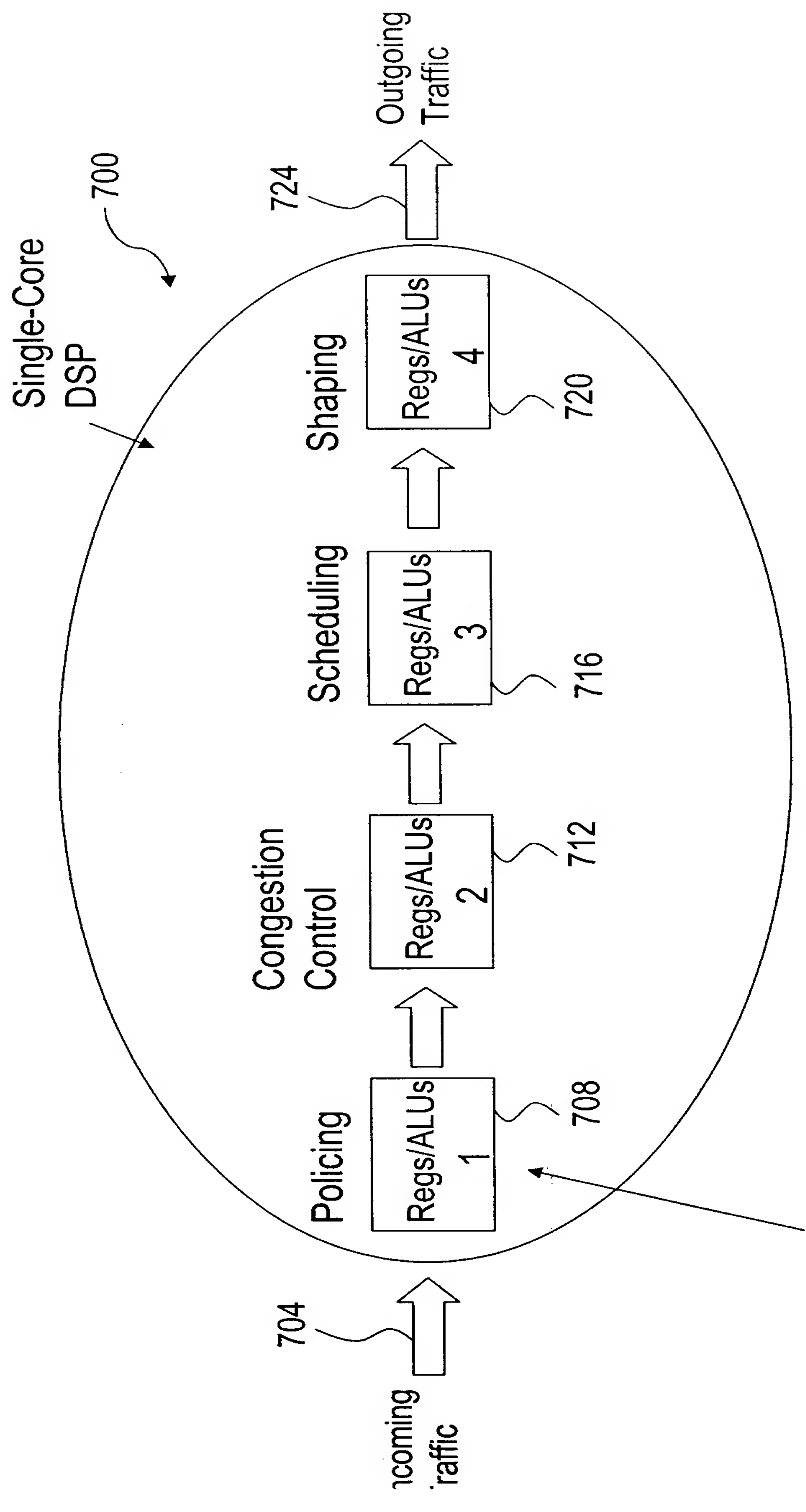


Fig. 6

Implement Traffic Management Functions in  
Single-Core DSP by Pipeline Processing Approach



Each Regs/ALUs is a set of Registers and/or Arithmetic Logic Units

FIG. 7

Implement Traffic Management Functions in  
Single-Core DSP by Parallel Processing Approach

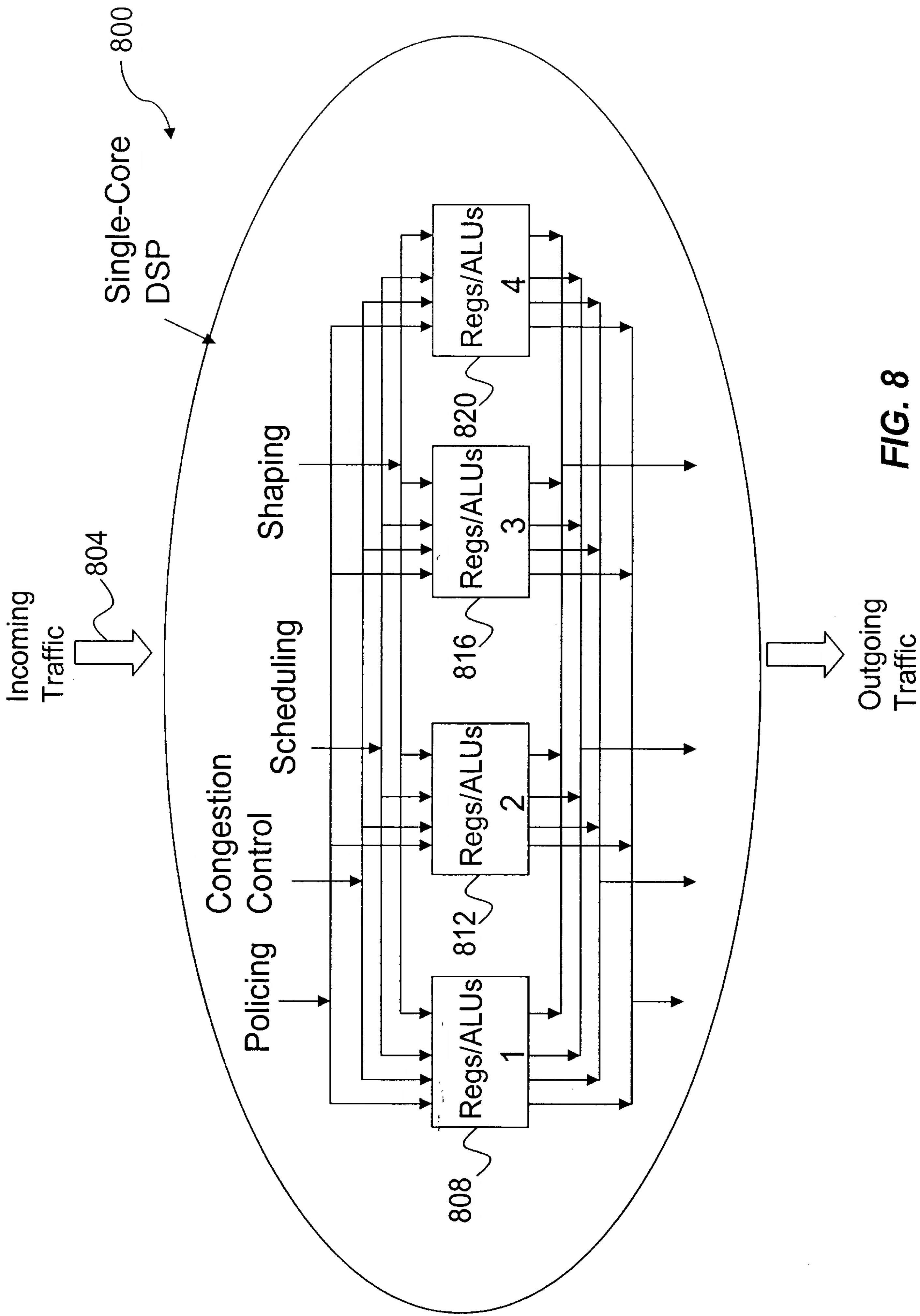


FIG. 8

Implement Traffic Management Functions in Single-Core DSP  
by Mixing Pipeline and Parallel Processing Approach

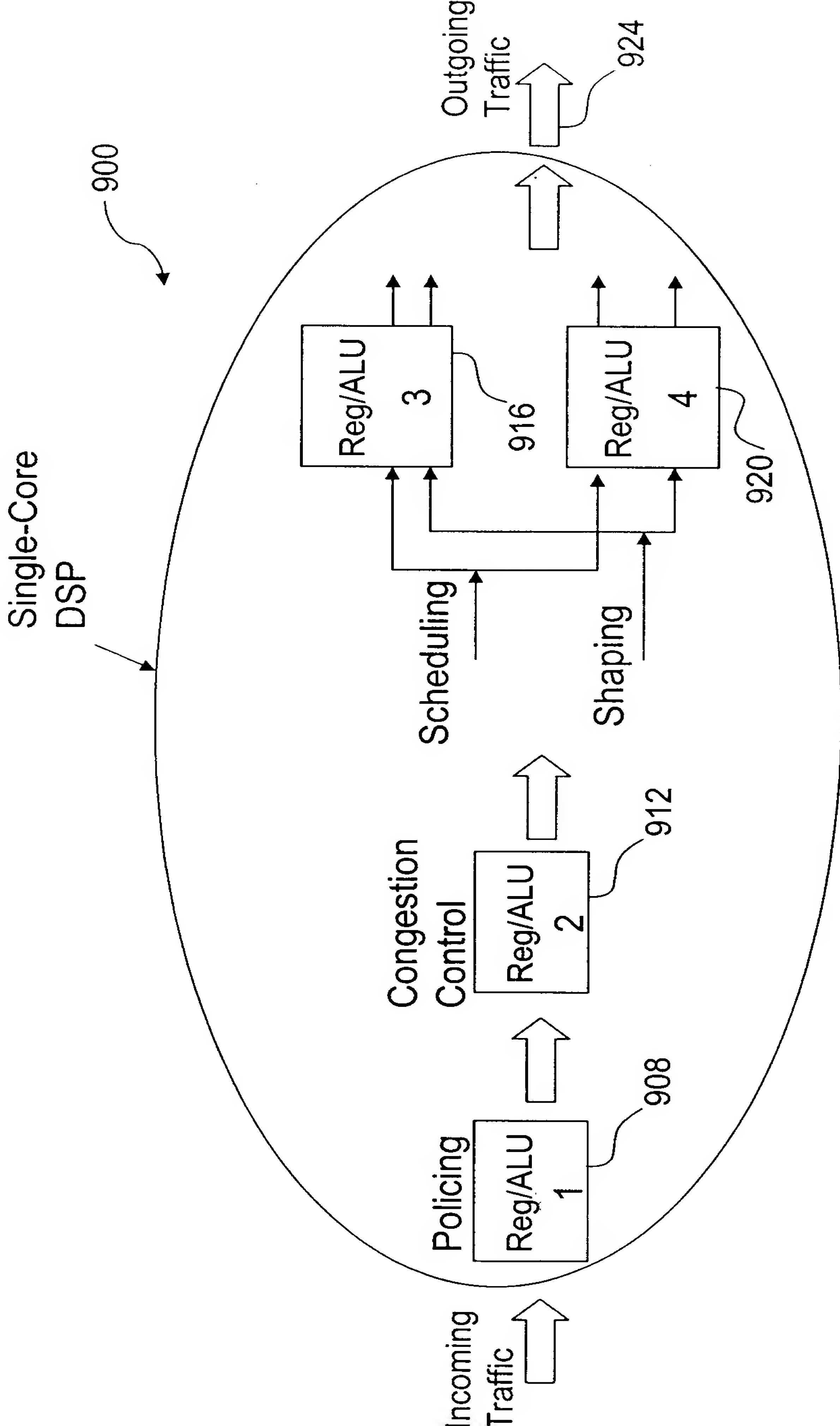


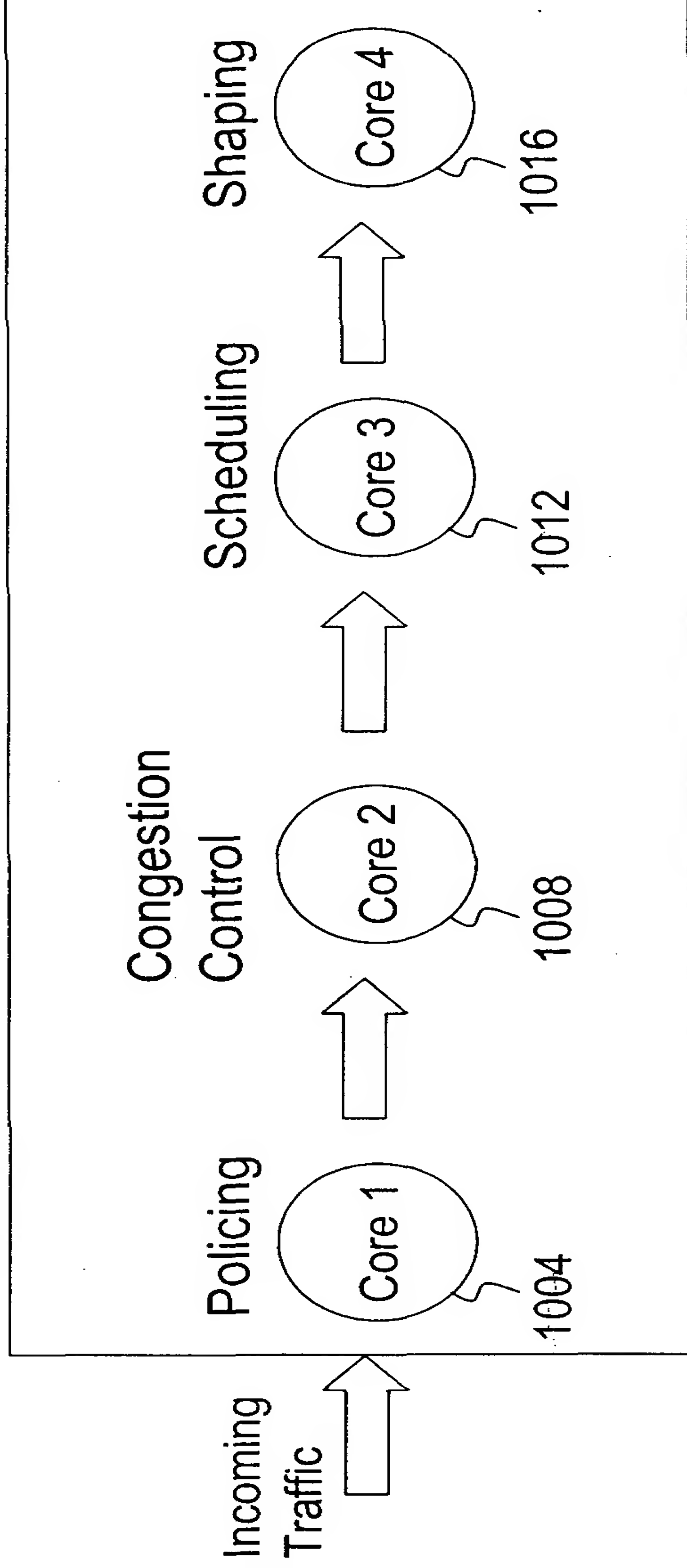
FIG. 9

# Implement Traffic Management Functions in Multiple-Core DSP by Pipeline Processing Approach

Multiple-Core

DSP

1000



Each core is equivalent to one single-core DSP

FIG. 10

Implement Traffic Management Functions in  
Multiple-Core DSP by Parallel Processing Approach

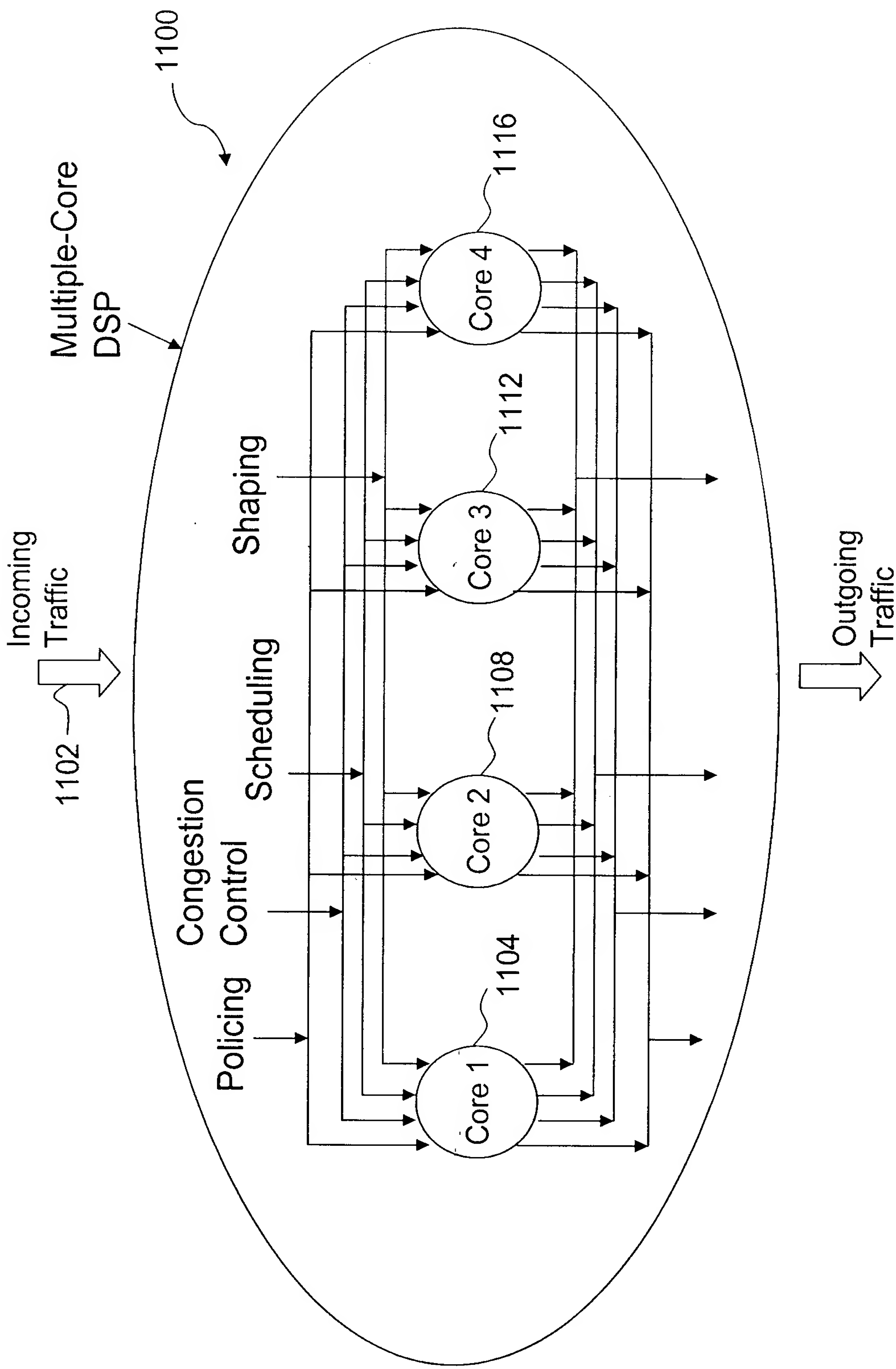


FIG. 11

# Implement Traffic Management Functions in Multiple-Core DSP by Mixing Pipeline and Parallel Processing Approach

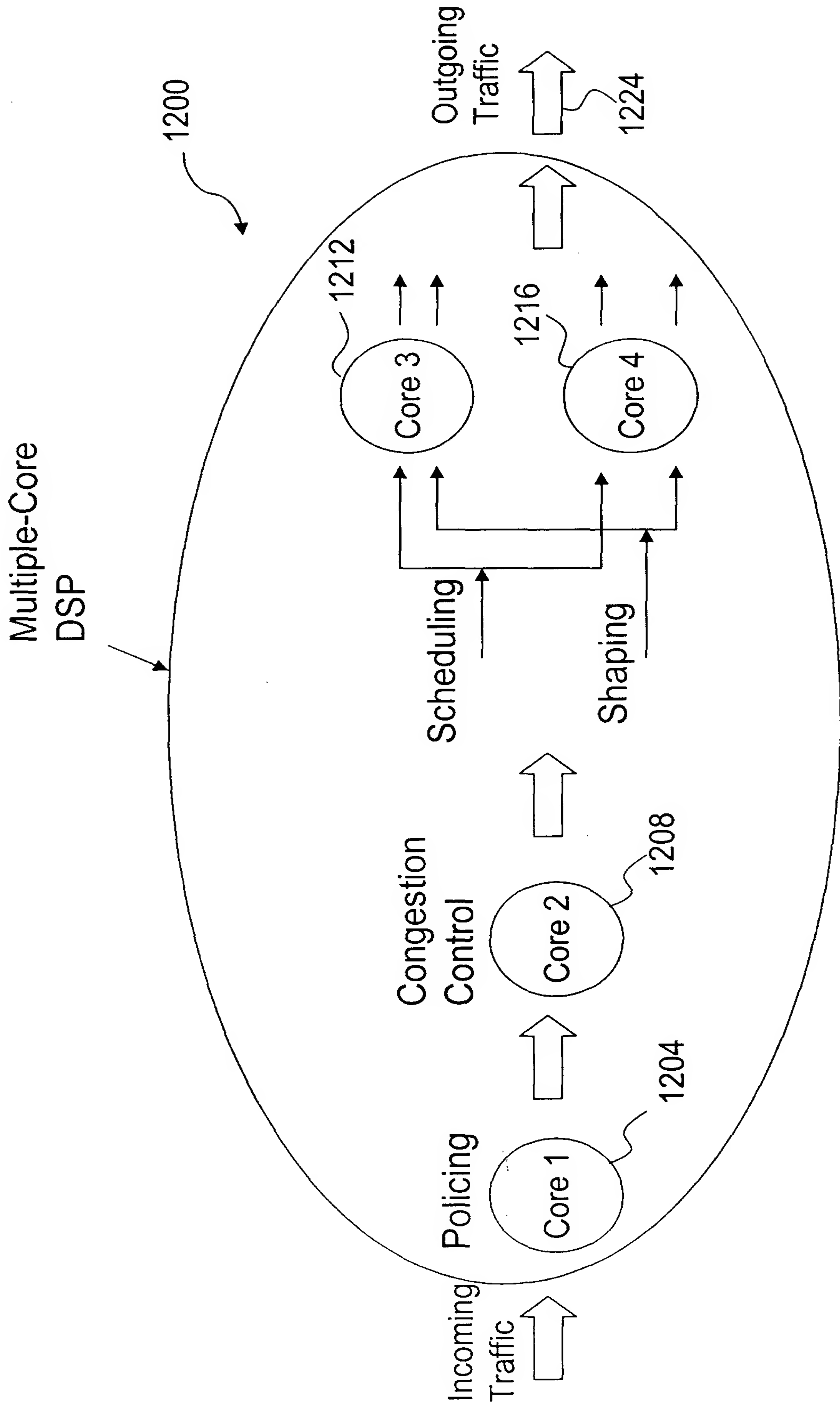
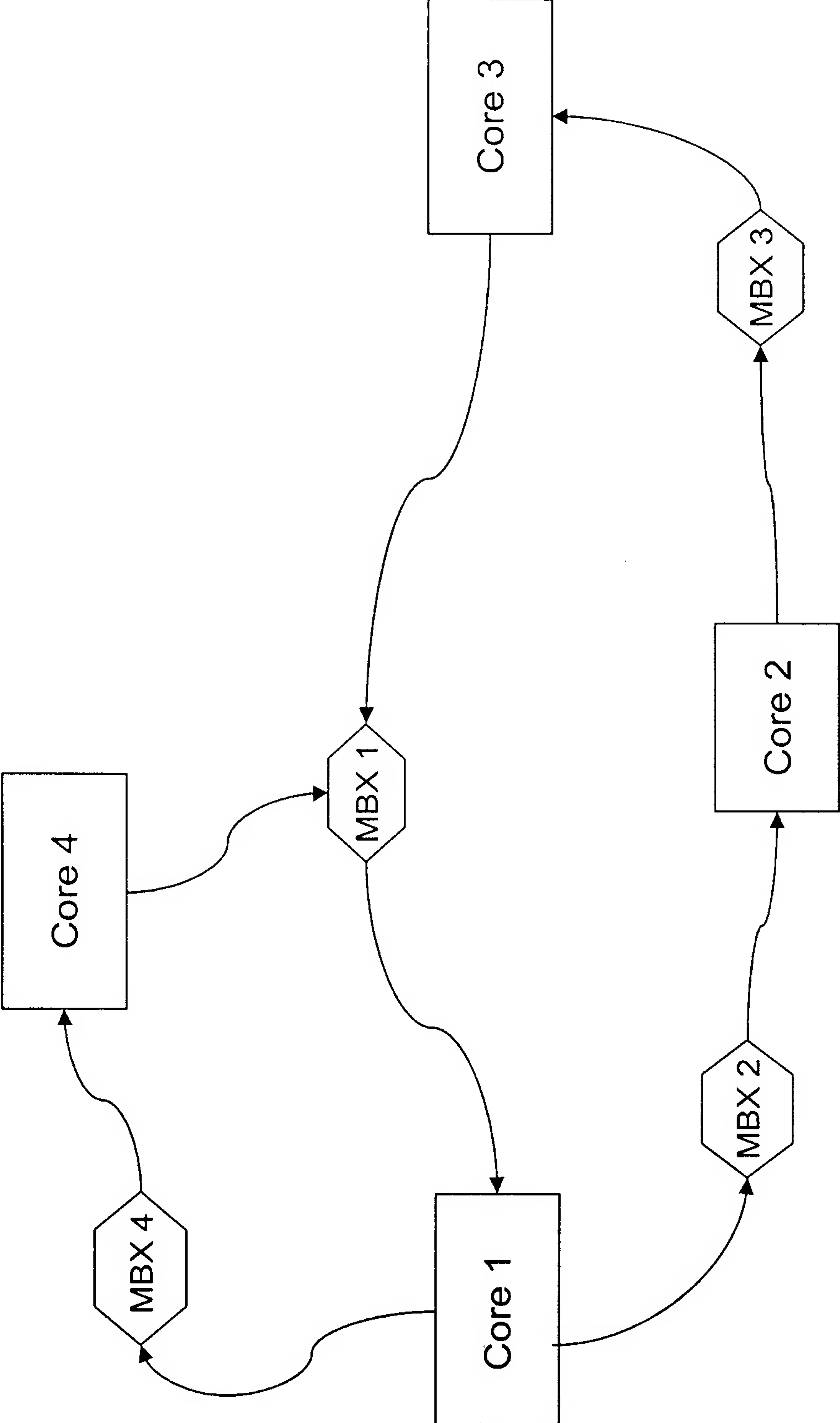


FIG. 12

Using Mailboxes to Communicate between Different DSP Cores



**FIG. 13**

# DSP Core Communications using Status Flags

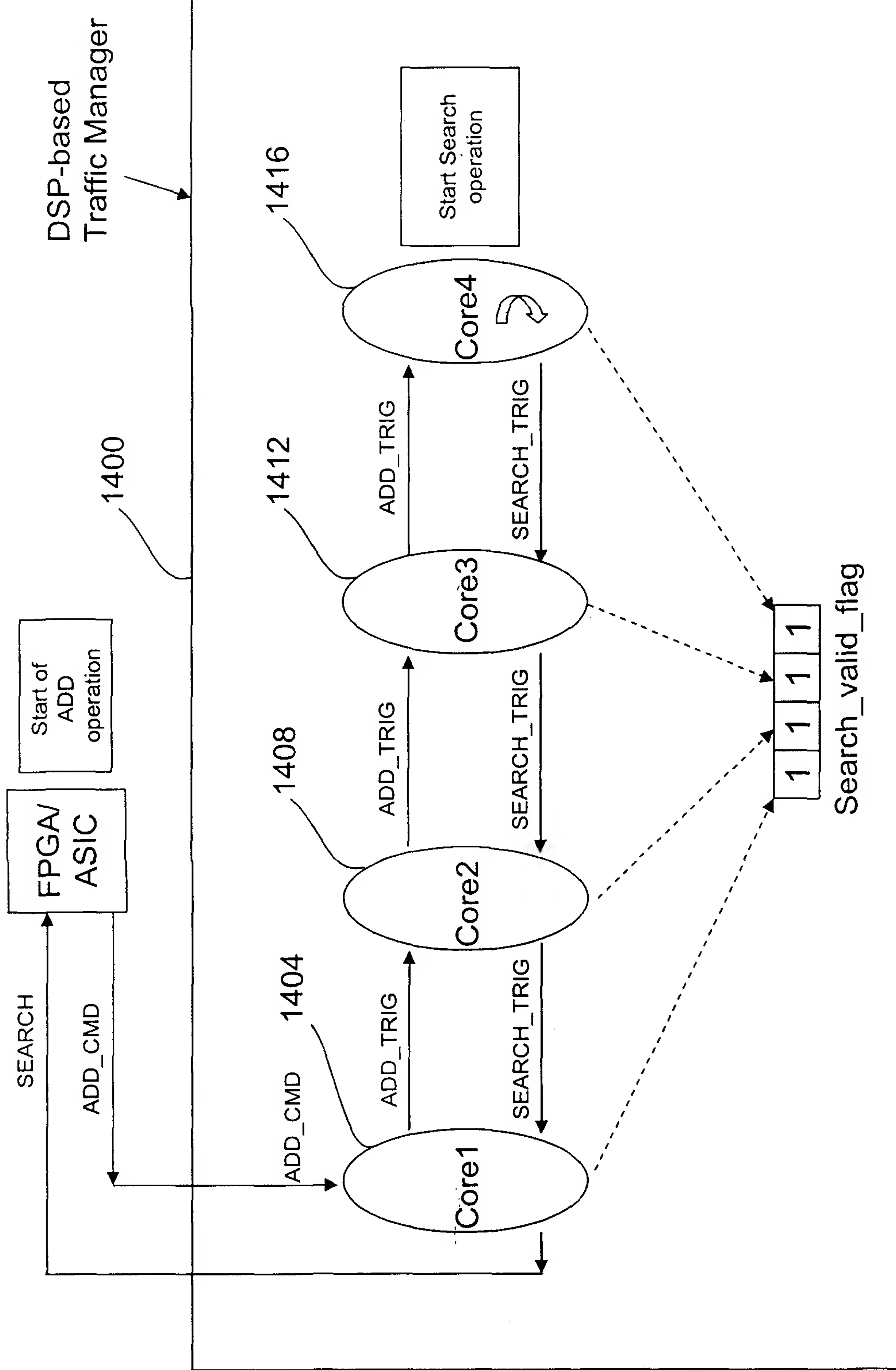


FIG. 14

# Use Sync\_Pattern to Guarantee Multiple DSP Cores Enter Wait\_Loop

SYNC\_PATTERN  
= 0x1234

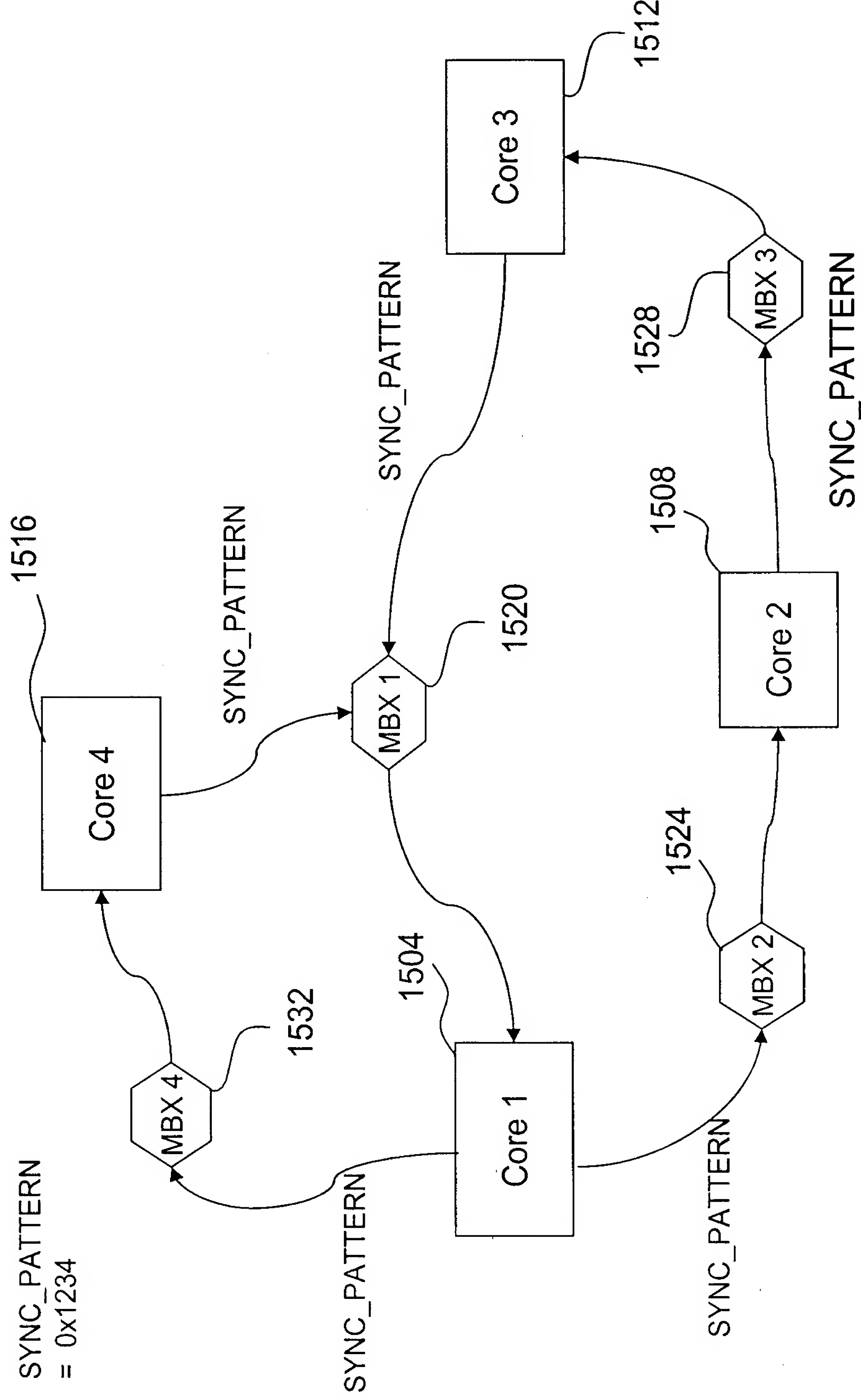


FIG. 15

Interrupt Mechanism with Timers

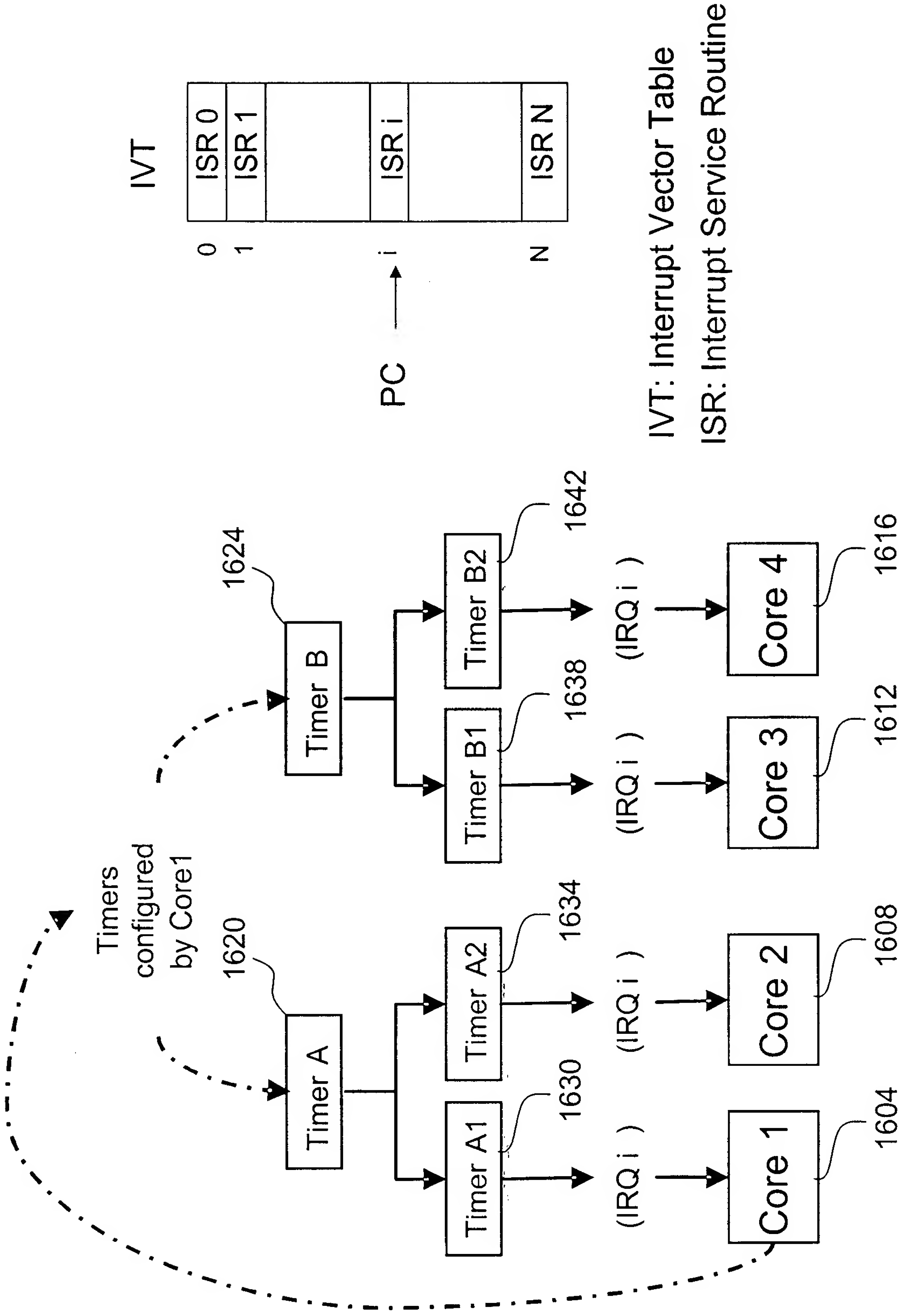
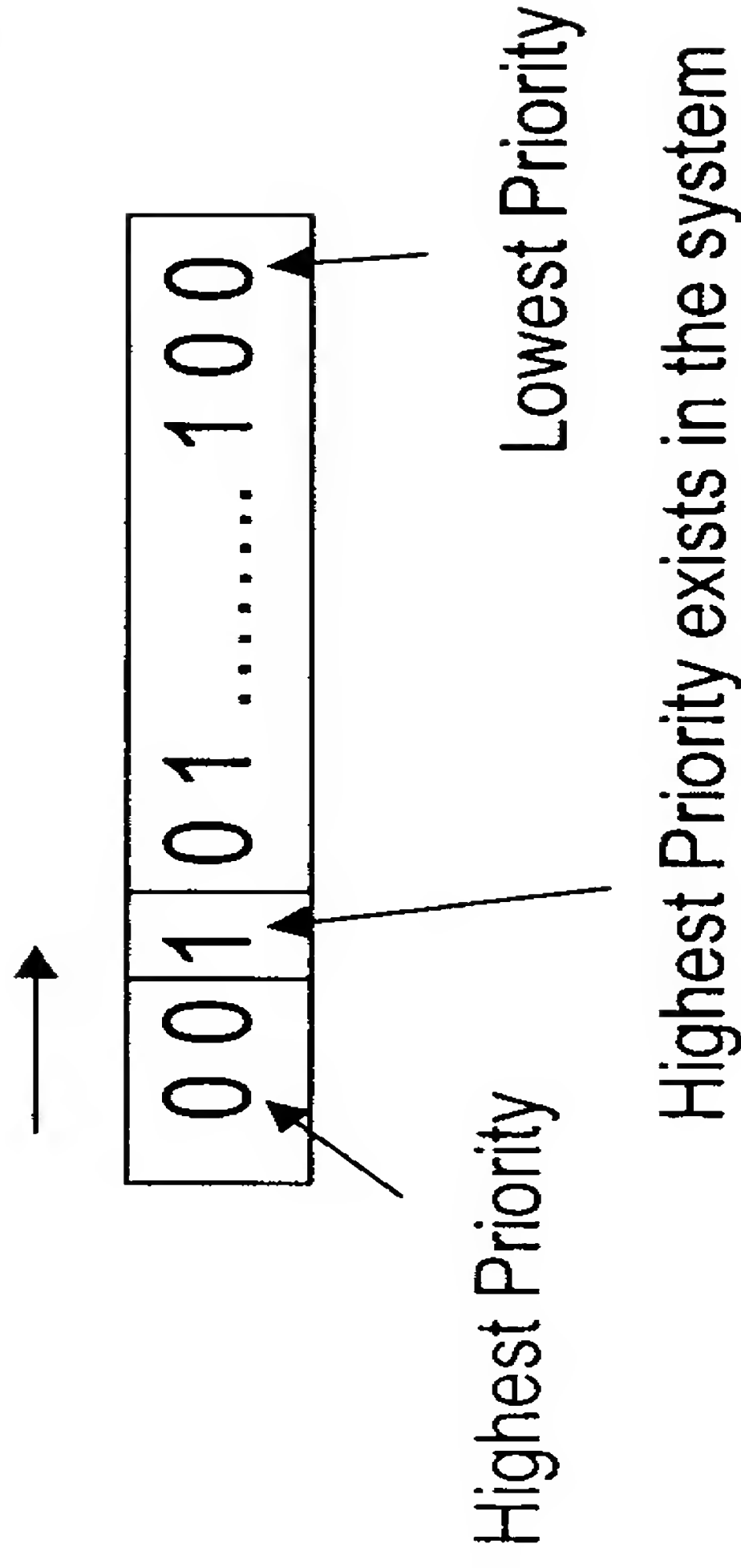


FIG. 16

## Search 1st Non-Zero Bit

Search 1<sup>st</sup> non-zero bit as the highest priority exists in the system

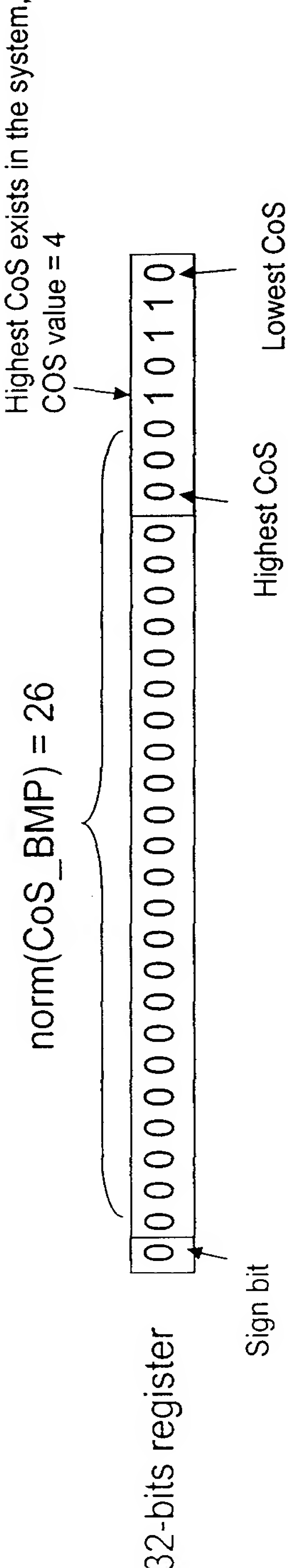


Priority: Can be

1. Class of Service (CoS)
2. TimeStamp value used to determine traffic (e.g., flow/packets) delivery sequence

**FIG. 17**

Search Highest CoS exists in the system using “norm”



norm(CoS\_BMP): Calculate how many redundant 0 from left to right (excludes the sign bit) in the CoS\_BMP

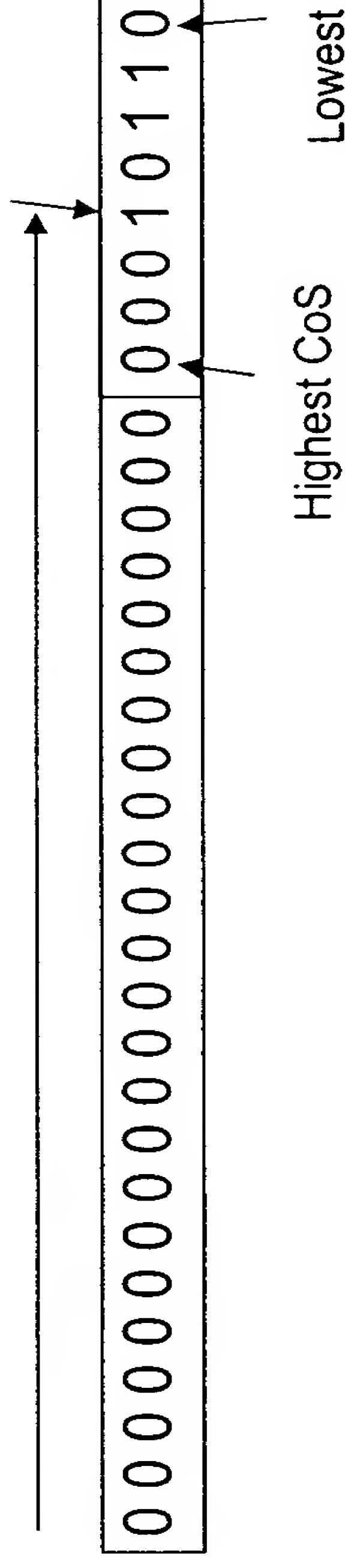
- A5 = CoS\_BMP

Assembly Language		Meanings	Results
{	mvk	30, A6	A6 ← 30
	norm	A5, A5	A5 ← norm(CoS_BMP)
	Sub	A6, A5, A6	A6 ← 30 - A5
			↑ Highest CoS exists in the system = 4

FIG. 18

# Search Highest CoS exists in the system using “Imbd”

Highest CoS exists in the system,  
COS value = 4

$$\text{Imbd}(1, \text{Cos\_BMP}) = 27$$


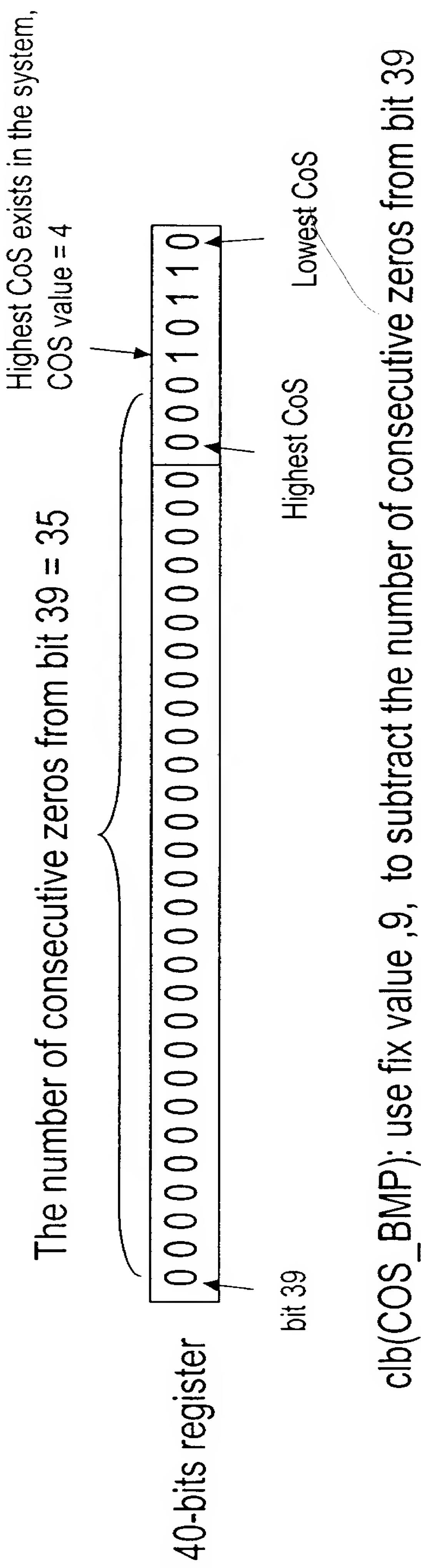
Imbd(1, COS\_BMP): Find the 1<sup>st</sup> "bit 1" position from left to right in the COS\_BMP

- $A5 = \text{Cos\_BMP}$

Assembly Language	Meanings	Results
{	31, A6	A6 ← 31
	1, A5, A5	A5 ← Imbd(1, CoS_BMP)
	A6, A5, A6	A6 ← A6 - A5
		<div style="display: flex; align-items: center;"> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> </div> <div style="display: flex; align-items: center;"> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; 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border-bottom: 1px solid black; margin-bottom: 5px;"></div> <div style="width: 100px; border-bottom: 1px solid black; margin-bottom: 5px;"></div> </div>

**FIG. 19**

Search Highest CoS exists in the system using “clb”



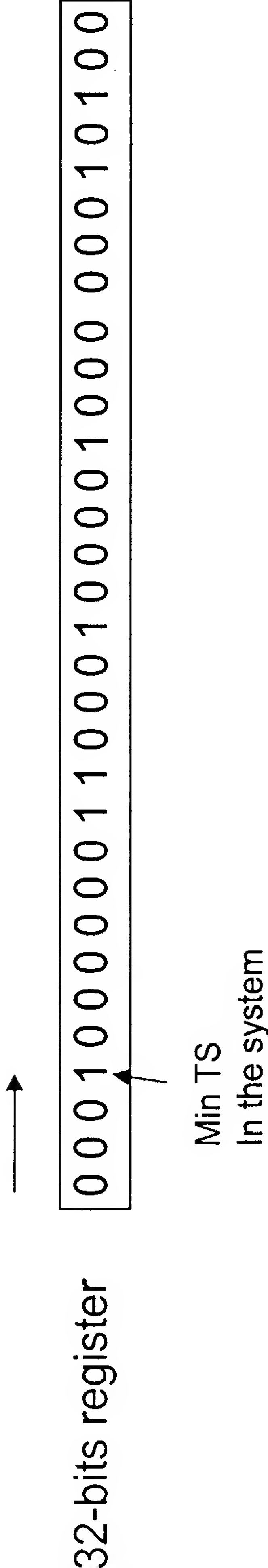
• A5 = CoS\_BMP

Assembly Language	Meanings	Results
{ clb add	A5, A5	A5 ← 9 – 35
	30, A5	A5 ← – 26 + 30 ↑
		Highest CoS exists in the system = 4

FIG. 20

Search Minimum TimeStamp value using “Imbd”

$\text{Imbd}(1, \text{TS\_BMP}) = 3$



$\text{Imbd}(1, \text{TS\_BMP})$ : Find the 1<sup>st</sup> “bit 1” position from left to right in the  $\text{TS\_BMP}$

- $A5 = \text{TS\_BMP}$

Assembly Language	Meanings	Results
{ Imbd      1, A5, A5	$A5 \leftarrow \text{Imbd}(1, \text{TS\_BMP})$	$A5 \leftarrow 3$ ↑
Minimum TimeStamp value = 3		

FIG. 21

# Traffic Manager based on DSP Farm

2200

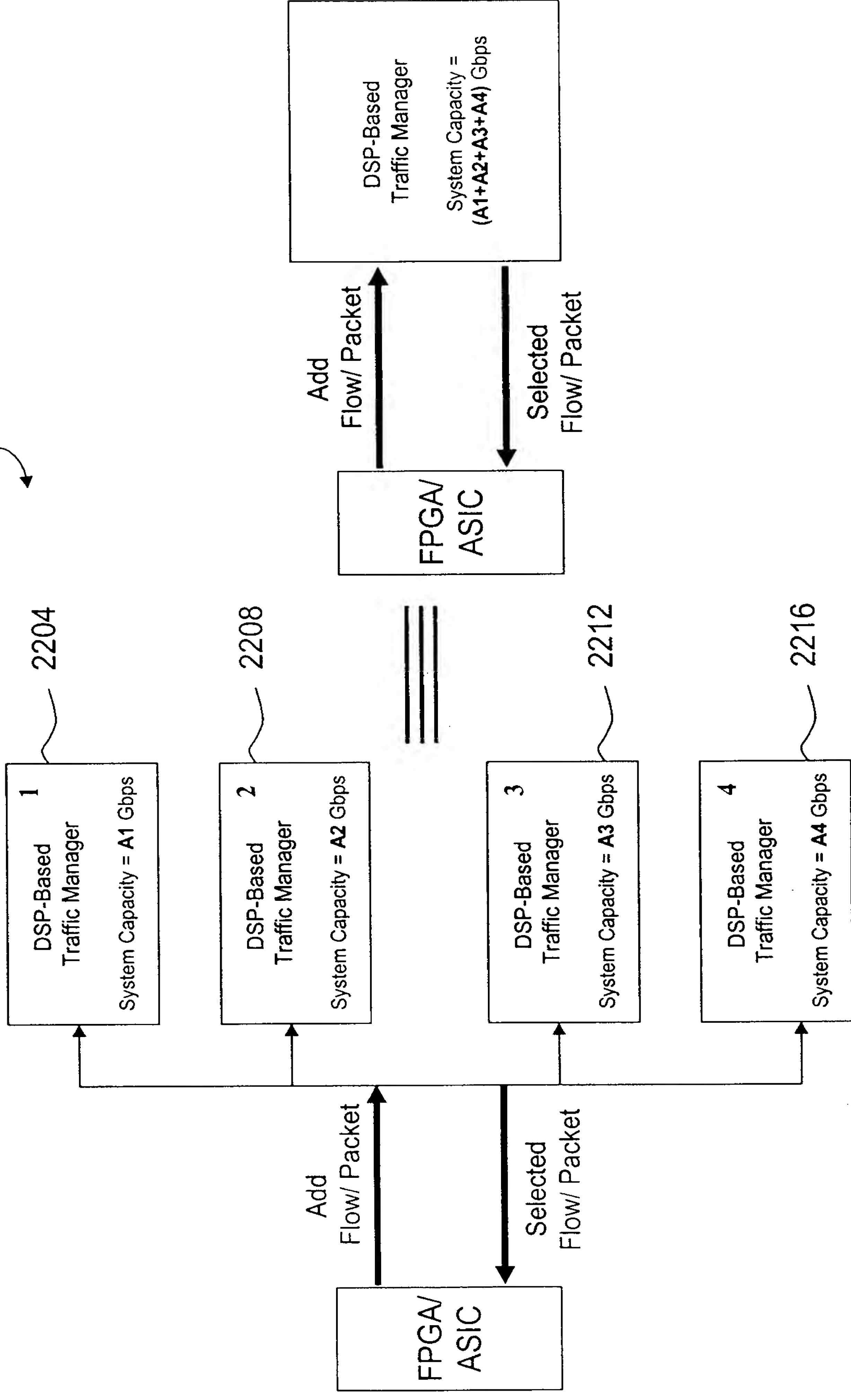


FIG. 22